WHAT IS ECOLOGY?

By H. A. Gleason

At a recent meeting of a well-known botanical society it was suggested somewhat jocularly that the field of plant ecology is not well defined, and that the speaker would welcome a further definition of the phases of plant life that are covered by it. Now the botanist who made this remark certainly does know what ecology is. So do also the various botanists who have made and are still making similar public statements on the same subject and to the same effect. They know from actual experience with the subject itself and with the men who work in it. The difficulty is that ecology is so different from the more familiar divisions of botanical science, morphology, physiology, and the like, that some of them fail to classify the subject properly in their own minds.

In order to present the matter, let us attempt a definition of botany, to be used as a point of departure in formulating later a definition of ecology.* Botany is the accumulation and organization of knowledge of plants. This definition holds for the student who learns from the printed page or the observer who takes his knowledge directly from the plant; for the beginner acquiring the most elementary rudiments of the science or the investigator extending the limits of knowledge. Botany does not properly refer to the plant itself, although it is sometimes used in that sense. A speaker may refer to the interesting botany of Mexico when he really means the interesting flora.

Morphology, as one branch of botany, may be defined by the addition of one limiting phrase to the definition of botany: it is the accumulation and organization of knowledge concerning the form and structure of plants. Strictly speaking, the term does not refer to the plant itself, yet in common usage it has frequently been applied in that way. For example, a teacher may ask of a student "Describe the morphology of the corn-kernel," when he really expects a description of its structure. Or he writes an article on the morphology of the vascular bundle of corn, and the title is accepted without criticism as referring to the structure

* In this connection see Torreya for May, 1912.—Ed.

of the bundle and not to our knowledge of its structure. This sounds like mere quibbling over the meaning of words: so it is introduced to show that a word originally applied to a division of knowledge is now applied to certain features of a plant. The same thing is true of physiology, of pathology, of various other -ologies, not merely in the general field of botany but in other sciences as well.

To revert to the original subject, plant ecology may be defined as the accumulation and organization of knowledge concerning the correlation between the plant and its normal environment. It now becomes difficult to divert the word from the meaning given here into a concrete application as has been done so successfully with morphology and physiology, because the subject is based not on the plant alone, but on the plant and its environment together. Nevertheless, the attempt is frequently made.

A botanist announces that he is studying the ecology of Smith's Bog. Narrowed down to an exact statement by careful questioning, he admits that Smith's Bog has no ecology, that he is really interested in the environmental relations of the plants there, and that he discovers these relations, at least in part, by observations on their form and behavior. Undoubtedly the original statement has brevity and is clear in its meaning, but it is impossible to include consistently any measurable or visible process or structure in a plant exclusively under the term ecology.

Two common expressions of this correlation between plant and environment are found, as just stated, in the structure and behavior of the plant. They must be studied by the methods of morphology and physiology, they must be described in the same terms used in morphology and physiology, yet the result of the study is neither: they deal with the structure and behavior of the plant, the result deals with the correlation between its structure and behavior and the environment. The elongation of the dandelion scape is a study in physiology, the structure and development of the pappus a study in morphology, the dissemination of the dandelion a study in ecology. But since the observable effect of the interrelation of plant and environment is frequently termed the morphology or physiology of the plant,

there is a not unnatural tendency on the part of morphologists and physiologists to consider ecology, or at least this part of it, as equivalent to or included in their own subjects. Since these subjects have accepted names, they ask "What is ecology?"

Another expression of the interrelation between plant and environment is seen in the restriction of a species to a particular type of environment, that is, to a particular habitat. This phenomenon can not be observed on a single individual, which is of course restricted to a single station, but must be studied from many individuals of one race. In this case the visible result is apart from either morphology or physiology, and to some botanists this alone is ecology, just as the behavior of a plant is physiology. But after all, the habitat-relation of a species is only one type of behavior, dependent upon the physiological functions of the single individual, but measured and tested by the behavior of many individuals or of the race.

It is hardly necessary to say that tangible or visible phenomena are frequently noticed before the underlying processes or correlations are discovered. Starch was known before photosynthesis; growth of trees before cambium. The morphological effect of ecological relations, such as alpine dwarfing, was known before the causes, which are even yet not fully understood. Plant associations were described long before their fundamental nature was appreciated.

In conclusion, let it be repeated that ecology is a division of knowledge, to be studied only through perceptible phenomena, which are frequently structural or functional in nature and therefore subjects for morphology and physiology also, but that the questions which ecology seeks to answer, the knowledge which it aims to supply, deal not with structure and function alone but with the correlation between the plant as a whole and the environment in which it grows.

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